

SCOPE OF CLAIMS

1. A radio communications device comprising:

a transmitter comprising:

a plurality of transmission antennas for radiating radio waves based on transmission RF signals;

5 a plurality of transmitting circuit means for supplying the transmission RF signals to said transmission antennas, respectively, based on a plurality of transmission signals; and

transmission signal processing means having modulating means, for modulating input transmission data to generate said transmission signals by using said modulating means, and for outputting the transmission signals to said transmitting circuit means;

a receiver comprising:

a plurality of reception antennas for receiving radio waves from said transmitter and outputting reception RF signals;

15 a plurality of receiving circuit means for outputting reception signals based on said reception RF signals input respectively from said reception antennas; and

reception signal processing means having demodulating means, for demodulating the reception signals output respectively from said receiving circuit means by using said demodulating means, and for generating reception data;

20 propagation detecting means for detecting a propagating state of said radio waves; and

symbol rate setting means for selecting a symbol rate to be used from a plurality of symbol rates based on the detected propagating state, and for

setting the selected symbol rate in said modulating means and said demodulating means.

2. A radio communications device comprising:

a transmitter comprising:

a plurality of transmission antennas for radiating radio waves based on transmission RF signals;

5 a plurality of transmitting circuit means for supplying the transmission RF signals to said transmission antennas, respectively, based on a plurality of transmission signals; and

transmission signal processing means having a plurality of modulating means having respective different symbol rates, for modulating
10 input transmission data to generate said transmission signals by using a selected one of said modulating means, and for outputting the transmission signals to said transmitting circuit means;

a receiver comprising:

a plurality of reception antennas for receiving the radio waves
15 from said transmitter and outputting reception RF signals;

a plurality of receiving circuit means for outputting reception signals based on said reception RF signals input respectively from said reception antennas; and

reception signal processing means having a plurality of demodulating means having respective different symbol rates, for
20 demodulating the reception signals input respectively from said receiving circuit means by using a selected one of said demodulating means, and for generating reception data;

propagation detecting means for detecting a propagating state of said
25 radio waves; and

modulating means/demodulating means selecting means for selecting
one of said modulating means and one of said demodulating means based
on the detected propagating state.

3. The radio communications device according to claim 1, wherein
said propagation detecting means detects the propagating state of said radio
waves according to at least one of the following: the level of a reception
electric power, a transmission error rate, a retransmission rate, or a channel
5 matrix estimated in a spatial multiplexing process.

4. The radio communications device according to claim 2, wherein
said propagation detecting means detects the propagating state of said radio
waves according to at least one of the following: the level of a reception
electric power, a transmission error rate, a retransmission rate, or a channel
5 matrix estimated in a spatial multiplexing process.

5. The radio communications device according to claim 3, further
comprising control means for determining the intensity of multipath
interference from the propagating state of said radio waves as detected by
said propagation detecting means, for instructing said symbol rate setting
5 means to set a high symbol rate in said modulating means and said
demodulating means when it is determined that multipath interference is
weak, and for instructing said symbol rate setting means to set a low symbol

rate in said modulating means and said demodulating means when it is determined that multipath interference is strong.

6. The radio communications device according to claim 4, further comprising control means for determining the intensity of multipath interference from the propagating state of said radio waves as detected by said propagation detecting means, for instructing said modulating means/demodulating means selecting means to select modulating means and demodulating means which have a high symbol rate when it is determined that multipath interference is weak, and for instructing said modulating means/demodulating means selecting means to select modulating means and demodulating means which have a low symbol rate when it is determined that multipath interference is strong.

7. The radio communications device according to claim 5, further comprising means for lowering the number of multiple values of modulation and demodulation in said modulating means and said demodulating means when said high symbol rate is set, and for increasing the number of multiple values of modulation and demodulation in said modulating means and said demodulating means when said low symbol rate is set.

8. The radio communications device according to claim 6, further comprising means for lowering the number of multiple values of modulation and demodulation in said modulating means and said demodulating means when said high symbol rate is selected, and for increasing the number of

5 multiple values of modulation and demodulation in said modulating means and said demodulating means when said low symbol rate is selected.

9. The radio communications device according to claim 5 or 7,
wherein said transmission signal processing means and said reception signal processing means reduce the number of said transmitting circuit means to be used and the number of said receiving circuit means to be used when
5 said high symbol rate is set, and increase the number of said transmitting circuit means to be used and the number of said receiving circuit means to be used when said low symbol rate is set.

10. The radio communications device according to claim 6 or 8,
wherein said transmission signal processing means and said reception signal processing means reduce the number of said transmitting circuit means to be used and the number of said receiving circuit means to be used when
5 said high symbol rate is selected, and increase the number of said transmitting circuit means to be used and the number of said receiving circuit means to be used when said low symbol rate is selected.

11. The radio communications device according to any one of claims 3 through 10, wherein said control means instructs said transmission signal processing means and said reception signal processing means to use one of said plurality of transmitting circuit means and one of said plurality of
5 receiving circuit means, respectively, when it is determined that multipath interference is weak, and instructs said transmission signal processing means and said reception signal processing means to use said plurality of

transmitting circuit means and said plurality of receiving circuit means, respectively, when it is determined that multipath interference is strong.

12. The radio communications device according to any one of claims 1 through 11, wherein said modulating means has modulation modes including a direct modulation mode for directly modulating said transmission data into a transmission carrier and a indirect modulation mode for
5 modulating said transmission data into a transmission carrier after the transmission data are processed, said demodulating means has demodulation modes including a direct demodulation mode for directly demodulating said reception signal to generate said reception data and a indirect demodulation mode for demodulating the reception signals and
10 thereafter processing the demodulated reception signals to generate said reception data, said radio communications device further comprising modulation/demodulation mode selecting means for selecting and setting said modulation modes and said demodulation modes.

13. The radio communications device according to claim 12, wherein said control means instructs said modulating means and said demodulating means to use said direct modulation mode and said direct demodulation mode, respectively, when it is determined that multipath interference is
5 weak, and instructs said modulating means and said demodulating means to use said indirect modulation mode and said indirect demodulation mode, respectively, when it is determined that multipath interference is strong.

14. The radio communications device according to any one of claims 11 through 13, wherein said control means instructs said modulating means and said demodulating means to select any one of modulating and demodulating processes including ASK, BPSK, FSK, QPSK, and DQPSK and to use one of said plurality of transmitting circuit means and one of said plurality of receiving circuit means, respectively, if it is determined that the multipath interference is weak, and instructs said modulating means and said demodulating means to select either of modulating and demodulating processes including multivalued PSK and multivalued QAM and to use said plurality of transmitting circuit means and said plurality of receiving circuit means, respectively, when it is determined that the multipath interference is strong.

15. The radio communications device according to any one of claims 9 through 11, 14, further comprising power supply control means for controlling power supplies of said plurality of transmitting circuit means and said plurality of receiving circuit means, respectively, to stop supplying electric power to the transmitting circuit means and the receiving circuit means which are not in use.

16. The radio communications device according to any one of claims 1 through 15, wherein said transmission antennas and said reception antennas are shared.

17. The radio communications device according to any one of claims 1 through 16, wherein said radio waves have a frequency of 10 GHz or higher.

18. A radio transmitter comprising:

a plurality of transmission antennas for radiating radio waves based on transmission RF signals;

5 a plurality of transmitting circuit means for supplying the transmission RF signals to said transmission antennas, respectively, based on a plurality of transmission signals;

transmission signal processing means having modulating means, for modulating input transmission data to generate said transmission signals by using said modulating means, and for outputting the transmission signals to
10 said transmitting circuit means; and

symbol rate setting means for selecting a symbol rate to be used from a plurality of symbol rates based on a detected propagating state of said radio waves, and for setting the selected symbol rate in said modulating means.

19. A radio receiver comprising:

a plurality of reception antennas for receiving radio waves from a transmitter and outputting reception RF signals;

5 a plurality of receiving circuit means for outputting reception signals based on said reception RF signals input respectively from said reception antennas;

reception signal processing means having demodulating means, for demodulating the reception signals output respectively from said receiving circuit means by using said demodulating means, and for generating
10 reception data; and
symbol rate setting means for selecting a symbol rate to be used from a plurality of symbol rates based on a detected propagating state of said radio waves, and for setting the selected symbol rate in said demodulating means.

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20. A radio transmitter comprising:

a plurality of transmission antennas for radiating radio waves based on transmission RF signals;

a plurality of transmitting circuit means for supplying the transmission
5 RF signals to said transmission antennas, respectively, based on a plurality of transmission signals;

transmission signal processing means having a plurality of modulating means having respective different symbol rates, for modulating input transmission data to generate said transmission signals by using a selected
10 one of said modulating means, and for outputting the transmission signals to said transmitting circuit means; and

modulating means selecting means for selecting one of said modulating means to be used based on a detected propagating state of said radio waves.

21. A radio receiver comprising:

a plurality of reception antennas for receiving radio waves and outputting reception RF signals;

5 a plurality of receiving circuit means for outputting reception signals based on said reception RF signals input respectively from said reception antennas; and

reception signal processing means having a plurality of demodulating means having respective different symbol rates, for demodulating the reception signals input respectively from said receiving circuit means by
10 using a selected one of said demodulating means, and for generating reception data; and

demodulating means selecting means for selecting one of said demodulating means to be used based on a detected propagating state of said radio waves.